

Questions from the DSO Proposers' Day

I. DSO MISSION & INTERESTS

1. Q: What are the office priorities and new program opportunities?

A: Information about office priorities can be found at DARPA's website (http://www.darpa.mil/Our_Work/DSO/). Any new program opportunities will be posted to the Federal Business Opportunities (<https://www.fbo.gov>) and/or Grants.gov (<http://www.grants.gov> websites.

2. Q: What are the technologies that are of specific interest to the Defense Sciences Office?

A: Technologies of interest can be found at DARPA's website (http://www.darpa.mil/Our_Work/DSO/) or the DSO Office-Wide BAA 14-46 (<https://www.fbo.gov/index?s=opportunity&mode=form&id=06df0efdd155a57152c5b2cf1523f657&tab=core&cview=0>).

3. Q: What is the vision for the new DSO? Is the focus on fundamental research similar to what it was in the old DSO?

A: See Questions I. 1, I.6 and II.1

4. Q: What are the DSO budget forecasts for next 3-5 years? What are the new technology thrusts? Where can I find information on Program Managers and their specific areas of interest?

A: Because the Government is subject to annual appropriations, DSO does not publicize a budget forecast. New focus areas are available at http://www.darpa.mil/Our_Work/DSO/. Program Manager information can be found here: http://www.darpa.mil/Our_Work/DSO/Personnel/, and the link to the DSO Proposers' Day slides are located at http://www.darpa.mil/Opportunities/Solicitations/DSO_Solicitations.aspx

5. Q: With BTO's opening, how has DSO's mission changed? What are the planned programs and potential programs?

A: The DSO mission is defined on the DARPA website (http://www.darpa.mil/Our_Work/DSO/). Any planned/potential programs will be announced via postings to the Federal Business Opportunities (<https://www.fbo.gov>) and/or <http://www.Grants.gov> websites.

6. Q: How has the reorganization affected DSO's role?

A: The mission of DSO is to identify and pursue high-risk/high-payoff research initiatives throughout a broad spectrum of science and engineering disciplines and to transform these initiatives into important, radically new military capabilities. This mission has not changed significantly with the reorganization.

7. Q: Is DSO still interested in things related to biology? And, if I'm interested in doing something related to biology, should I talk to DSO, BTO or MTO?

A: The short answer is Yes. If the technology is exclusively for biology, about biology, by biology, it would probably make more sense to submit the idea to BTO. However, there are some crossover technologies that lead to multiple applications and/or are multidisciplinary with biological elements that would probably be applicable to both DSO and BTO.

If you are unsure which office the technology would fit best, you can reach out to the program managers you think might be interested in the idea to receive feedback and find out about next steps.

8. Q: What are the primary interest areas for this office now and in the future (strategy going forward)?

A: Information about office interest areas and overall strategy can be found at DARPA's website (http://www.darpa.mil/Our_Work/DSO/).

9. Q: Are the ideas we're proposing supportable by DSO? Which ones should go to BTO? Who are the key PMs we should be talking to.

A. Focus areas specific to DSO and BTO are posted on their respective webpages as is PM contact information along with the programs they manage.
http://www.darpa.mil/Our_Work/DSO/

10. Q: Who do we talk to about biotechnology, e.g. biosensors? BTO, DSO or both?

A: Both

11. Q: Autonomy, complexity, uncertainty of large networks all seem to be key research areas that many program managers are interested in. How do proposers decide whom to contact?

A: You are encouraged to talk to the program managers to help you in determining who, if anyone, is interested in your idea. If you are still in doubt, we suggest you submit your idea as an executive summary to the DSO Office-Wide BAA (DARPA-BAA-14-46).

12. Q: Can you say whether the development of new scientific instruments for neurosciences would belong in DSO or BTO?

A: New scientific instruments that push the fundamental laws of science are of interest to DSO. If the end application is for neuroscience, but there are benefits to multiple applications, then the idea may be appropriate to DSO.

13. Q: Is DSO interested in funding applied or more fundamental research?

A: DSO funds both basic and applied research as dictated by the science or technology associated with a given program.

14. Q: Where is best base for Defense Manufacturing? Your slides indicated that it existed but moved to MTO?

A: The discussion on the Defense Manufacturing Office was in conjunction with the history of DSO. The Agency no longer has a Defense Manufacturing Office but DSO program managers are working in manufacturing science. Manufacturing interest in other offices can be found on the DARPA website.

II. GENERAL INFORMATION

1. Q: What's the typical level of technical maturity sought?

A: There is no typical technical maturity level for DSO programs. However, DSO programs can be either fundamental research or applied research, and only very rarely includes advanced technology development.

2. Q: Are there particular directions that are envisioned for the BAA topics? For each topic, are there directions that are of particular interest to DSO? Is there any specific information you would like to see in every executive summary submitted in response to the BAA?

A: Topics will not be further defined in addition to what is listed in the BAA. Per the BAA, "The typical executive summary should express a consolidated effort in support of one or more related technical concepts or ideas."

3. Q: What are the research directions that DARPA is interested in?

A: DARPA solicitations can be found here:

http://www.darpa.mil/Opportunities/Solicitations/DARPA_Solicitations.aspx

4. Q: What is the general overview as to the whole application process to submit a proposal to DARPA?

A: Submission information can be found beginning on page 15 of the BAA. Proposals are considered source selection sensitive materials, and, as such, are not made available for public review. Some of this information is summarized in the slides under the DSO Proposers' Day Materials at http://www.darpa.mil/Opportunities/Solicitations/DSO_Solicitations.aspx, but should not be a substitute for reading the BAA.

5. Q: Does DSO plan on using the "Challenge" format?

A: The challenge format might be used at some point by DSO. This will depend on program development and plans of the individual program managers.

6. Q: Is there going to be an equivalent [to Proposers' Day] for BTO?

A: Please watch for special notices posted on <https://www.fbo.gov/>.

7. Q: Would future BAAs place more emphasis on developing tools or integrated systems?

A: BAAs are developed based on program manager's ideas and goals for their programs. It will be driven by the quality of the idea, the technology, and what we really want to invest in at that time.

III. SEEDLINGS & STUDIES

1. Q: How does the seedling process work?

A: Occasionally, DSO funds small, short duration studies, often called "seedlings", that inform potential future programs. Proposals to perform these sorts of studies are generally submitted under the DSO Office-Wide BAA.

2. Q: What options or avenues exist for supporting seedling efforts?

A: See Question III. 1.

3. Q: How much of a feasibility demo would be needed for something, like, at the Seedling level, sort of an initial exploratory idea? And what are the expectations regarding technology demos?"

A: Seedling-type projects are used to address critical technical questions that surround a specific scientific challenge. The outputs from seedling projects allow the program manager to generate and justify a larger investment to fully develop a new scientific area. The feasibility level is going to really depend on the question being posed, and in the specific technology area under consideration.

4. Q: Is DSO emphasizing the Office-Wide BAA as a mechanism to generate Seedling foundational concepts for future BAAs?

A: Yes. The intent of the Office BAA is to get revolutionary ideas. We presented program managers' interests to provide concepts of what they are most interested in. But if you want to challenge us with completely new ideas – things that you think we may not have even thought of – it is a mechanism for that, as well. Think of the Seedling as, "Moving us from disbelief to doubt." So, if a program manager is excited and wants to take that chance and do an experiment or calculation or a model through a Seedling in order to see how to get to that point of only being doubtful instead of disbelieving. It is often that point where that program manager is, then, interested in moving forward internally to see if they can construct a bigger program and get approval to go forward. If that happens, then what you'll see coming out the other side is a program BAA for a larger program. So there is, very often, a link between the Seedlings that are coming in and the programs that are coming out at the other side.

IV. SBIRs/STTRs

- 1. Q: What is DARPA's interest level concerning the SBIR/STTR programs? The number of topics solicited by DARPA seems small relative to other DoD agencies.**

A: DARPA Program Managers are very interested in the SBIR/STTR programs, and are encouraged to generate topics that support an existing program, support an approved new start, investigate potential for a new program, or investigate a disruptive technology. Program Managers may use SBIR or STTR projects to identify options with leap ahead or disruptive potential, or to explore risk mitigation alternatives during the technology development and system development and demonstration phases, or to identify manufacturing commercialization opportunities. Therefore, the research and technologies developed through the SBIR/STTR programs contribute to system capability improvements at all stages of developmental and operational maturity.

Agencies are not required to publish a minimum number of topics. DARPA's SBIR and STTR budgets are calculated in accordance with the statutory set-aside percentages. The resulting budget determines the number of topics that will be advertised in each SBIR and STTR solicitation and the affordability of those topics through Phase 1 and Phase 2. Visit http://www.darpa.mil/Opportunities/SBIR_STTR/ for more information on the DARPA SBIR and STTR programs.

Program Managers not only engage with the small business community through the SBIR and STTR programs, but also through DARPA's Broad Agency Announcements (BAA), which are open to all capable sources.

V. PROPOSALS

- 1. Q: What mechanisms are in place for exploring teaming arrangements with other proposers?**

A: DSO does not participate in the formation of proposal teams. These arrangements, though they may be facilitated through program-specific proposers' workshops, are left to the proposer.

- 2. Q: Can we cooperate with European R&D centers or companies?**

A: Yes, as long as ITAR guidelines and national security rules are followed by the proposers. If you have questions regarding ITAR, please reach out to DARPA security personnel who can assist. Please see the Security Rules of the Road under the DSO Proposers' Day Materials for more information. http://www.darpa.mil/Opportunities/Solicitations/DSO_Solicitations.aspx

- 3. Q: What opportunities are there for work in collaboration with DARPA and DARPA performers to translate cognitive neuroscience research into fast fielded practical application?**

A: DSO does not participate in the formation of proposal teams. These arrangements, though they may be facilitated through program-specific proposers' workshops, are left to the proposer. For a list of current solicitations please see
http://www.darpa.mil/Opportunities/Solicitations/DARPA_Solicitations.aspx.

4. **Q: What level of preliminary data is needed in a typical proposal? Specific topics of interest? Selection criteria?**

A: Topics of interest are listed in the BAA beginning on page 6. Evaluation criteria can be found on page 29.

VI. COST

1. **Q: Budget size, number investigators allowed; equipment vs. personnel support**

A: Per the BAA, "The amount of resources made available under this BAA will depend on the quality of the proposals received and the availability of funds." There are no personnel or funding restrictions.

VII. TECHNICAL

1. **Q: Whether Novel Sensors and Autonomy may be combined, as for example with mobile EEG eyeglass SQUID neuromagnetometer and neurofeedback systems?**

A: Novel ideas that span multiple DSO focus areas are of interest. The value of these ideas to the program manager will depend on the technical impact that they provide to meeting the overall program objectives. Details regarding Novel Sensors and Supervised Autonomy areas of interest can be found on pages 6-7 in the DSO Office Wide BAA-14-16.

2. **Q: Are there generalized electromechanical attributes that are being targeted (TEMPEST, extreme heat or vibration, volume, etc.)?**

A: Many of the DSO programs are focused on developing and demonstrating new technologies that will provide a revolutionary leap in performance. If you are proposing to develop new electromechanical devices that provide a significant improvement in performance at reduced SWaP, then you should discuss your idea with a program manager to determine what specific metrics are important. We suggest that you visit the DSO website for further details on the program managers' specific areas of interests.

3. **Q: What is DARPA's long range plan for autonomy? In DARPA's view, what are the critical gaps in the current state of autonomy?**

A: The DSO investment strategy is very fluid and opportunistic, which means that we are constantly looking for new ideas that will have a significant impact in the field of autonomy. Please review the Office-Wide BAA for more details on Supervised Autonomy.

4. **Q: "What problems need to be solved for cloud autonomy? What are the DARPA-hard problems in this field?"**

A: Several topics stand out as open problems, from easiest to hardest. The easiest one is perception - how to exploit the huge databases on the cloud - for example the one trillion images that people have uploaded to Facebook - by learning how to detect, classify, and recognize common objects. DARPA has made some early investments and now the commercial world is working hard on this problem.

5. **Q: How should a robot act in a given circumstance? How can one robot learn how to behave from the experience of a different one? Perhaps when it got stuck, a human being then guided it out of the situation that it got stuck in. How can we encode that help and use it to guide a future machine so that it does not need to call for help?**

A: We are only beginning to make progress on this question, and industry is looking at it, too. DARPA does not have anywhere near the budget that the commercial world does. We need to ask "Why DARPA? Why do it here?" If you send in a proposal to do work that we know is happening at a much higher funding level in the commercial world, there is a low chance that DARPA is going to fund it. What we are looking at is, "What are the DoD-specific things that the commercial world, on its own, is not going to do that are DARPA-hard?" One challenging problem is, "What happens when you disconnect from the cloud?" Imagine that the robot has some capability to store data, and some capability for computation - and, occasionally, it has a connection to the cloud. When it is connected to the cloud, it has access to millions of examples that it can take advantage of to act and react. While connected, the system should have a strategy to store internally a set of examples that have a high probability of being useful when the connection is lost.

6. **Q: In regards to autonomy, How do you distill and store the examples that you are likely to need in the near future? How do you store the behavioral examples you are likely to need in the near future, so that when disconnection occurs, you can still have some level of competence?**

A: That is DARPA-hard - the commercial world will probably not do it for quite a while because, for them, they can assume that the connection is always there and is always good - and when it's not, it's okay for the robot to just stop and wait for somebody to fix the link. The DoD cannot afford to do that.

7. **Q: "How do you trust autonomy?"**

A: This is a more general question of humans, machines, and trust. When a warfighter has their life depending on a machine, how does one build that machine in a way that the warfighter really can trust it enough to use it? Very, very hard to figure out. This is not too different than the issue of the driverless car, and how can we trust that that is going to be safe for us to drive in? So this whole general question of trust in man-machine systems is, I think, one that is particularly an important problem for the DoD.

8. Q: How are cyber security concerns factored into respective programs (where relevant)?

A: DSO may be interested in new science and technologies that can impact cyber security. If you are proposing to develop a technology that addresses cyber security concerns, then you should discuss your idea with a program manager to determine what specific metrics are important. Information on DSO Program Managers' specific areas of interest can be found on the DSO website: http://www.darpa.mil/Our_Work/DSO/Personnel/. If a DSO program requires some level of cyber security in the developed technology, that information is typically provided in the BAA that solicits the technology.

9. Q: The scope of applications DARPA DSO is interested in for Focus Area Novel Sensing and Detection Enabled by New Science. What is the DSO definition of "new" science?

A: Details regarding Novel Sensing and Detection Enabled by New Science can be found on page 7 in the DSO Office-Wide BAA (DARPA-14-46). The descriptive paragraph provides more information on DSO's interests.

10. Q: What are opportunities for fiber reinforced polymer composites and funding availability?

A: Polymer matrix composites are an important technology to DoD, and DSO is interested in new innovative research concepts that impact defense and national security. It is important to note that DSO is not interested in approaches or technologies that make incremental or evolutionary advancements over the state of the art. Please review the Office-Wide BAA for more details on materials research.

11. Q: What types of research areas or long-term targeted applications pertain to transformative materials initiatives of critical importance to DARPA?

A: Details regarding Transformative Materials can be found on page 6 in the DSO Office-Wide BAA (DARPA-14-46). The descriptive paragraph provides more information on specific topics of interest.

12. Q: How can Directed Assembly based manufacturing be used to produce transformative materials with novel and unique?

A: Details regarding Transformative Materials can be found on page 6 in the DSO Office-Wide BAA (DARPA-14-46). The descriptive paragraph provides more information on specific topics of interest.

13. Q: How do you define transformative technology? Can you give a few concrete transformative technology in advanced materials? Areas of focus for technology development in knowledge representation.

A: Transformative technology allows for radical (not incremental) changes to the solution space for a problem or set of problems. The Proposers' Day slides (http://www.darpa.mil/Opportunities/Solicitations/DSO_Solicitations.aspx) provide examples of past material science developments that were at the time of initiation, transformative. Details regarding Mathematics and Complexity can be found on pages 6-7 in the DSO Office Wide Open BAA (DARPA-14-46). The descriptive paragraph incorporates the knowledge representation topic.

14. Q: For topic a), what are the physical domains being considered? Is optics and photonics of interest to the call?

A: Please review the Office-Wide BAA for more specific details on Physical Sciences. The descriptive paragraph now incorporates the Fundamental Limits of Physical Phenomena topic.

15. Q: I would like to understand DSO's interest space moving forward in quantum-limited/quantum-enabled optical information processing for applications to communications, sensing and computation.

A: Please review the Office-Wide BAA for more specific details on Physical Sciences. The descriptive paragraph now incorporates the Fundamental Limits of Physical Phenomena topic.

16. Q: Detailed information on Novel Sensing and Detection Enabled by New Science

A: Please review the Office-Wide BAA for more specific details on Novel Sensing and Detection Enabled by New Science.

17. Q: Is there interest in non-contact high throughput particle manipulation?

A: Please review the Office-Wide BAA for more specific details on Transformative Materials.

18. Q: What are the primary research thrusts in advanced materials? What propulsion technologies should vertical lift consider? Is plasma flow control an area of interest.

A: Please review the Office-Wide BAA for more specific details on Transformative Materials.

19. Q: What is the scope of acceptable technical approaches to the "Underpinnings of Autonomy" focus area? In particular, are technical approaches drawn from biologically consistent understandings of global brain function of interest?

A: Please review the Office-Wide BAA for more specific details on Supervised Autonomy.

20. Q: Our objective would be to learn how best to respond to the SDR transceiver needs of DARPA. We offer programmable transceivers that operate from 3-12 GHz. Development of

these semiconductor chips has been funded, in part, by the U.S. Government. We are especially interested in the LEAP program.

A: The topics you are proposing are not covered in DSO's Office-Wide BAA. Your topics of interest might fit better in the Microsystems Technology Office mission. LEAP is an MTO program.

21. Q: Please provide specific examples of projects that would fall under Focus Areas: 1. Novel Sensing and Detection Enabled by New Science; 2. Transformative Materials; 3. Materials Design Across Multiple Length Scales

A: Topics of interest are explained in the Office-Wide BAA, DARPA-BAA-14-46, (<https://www.fbo.gov/index?s=opportunity&mode=form&id=06df0efdd155a57152c5b2cf1523f657&tab=core&cview=0>).

22. Q: What is the importance of hypersonics platforms to materials needs and what are the challenges if they are important?

A: DSO sees the aggressive demands placed on hypersonic materials as a driver for the materials science community to develop innovative approaches and solutions beyond the capability of current materials systems. The Transformative Materials section (found on page 6 in the DSO Office-Wide BAA DARPA-14-46) provides a descriptive paragraph with more information on specific topics of interest.

23. Q: What opportunities are available in the Aerospace industry?

A: DARPA solicitations can be found here:
http://www.darpa.mil/Opportunities/Solicitations/DARPA_Solicitations.aspx

24. Q: Areas of funding interest to DSO in the area of BioSensors

A: If you are proposing to develop new BioSensor technology that provides a significant improvement in performance, then you should discuss your idea with a program manager to determine what specific metrics are important. We suggest that you visit the DSO and BTO websites for further details on the program managers' specific areas of interests.

25. Q: Would you consider biologically inspired design as a transformative approach to the materials design process? This process greatly expands the design space with physical testing over millions of years represented as living organisms manufactured by natural processes. Nature has down selected the possible choices, thus identifying successful strategies for materials design. By starting with the designs successful in Nature, the design process is greatly shortened, accelerating innovation.

A: If you are proposing to develop new technology based on biologically inspired design that provides a significant improvement in performance, then you should discuss your idea with a

program manager to determine what specific metrics are important. We suggest that you visit the DSO and BTO websites for further details on the program managers' specific areas of interests.